OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from the **OSSIPEE LAKE SYSTEM (Berry Bay, Broad Bay, Lake Ossipee, Leavitt Bay, and Lower Danforth Pond),** the program coordinators have made the following observations and recommendations:

We would like to thank your group for sampling each lake **once** this summer. However, we encourage your monitoring group to sample **additional** times each summer. Typically we recommend that monitoring groups sample **three times** per summer (once in **June**, **July**, and **August**). We understand that the number of sampling events you decide to conduct per summer will depend upon volunteer availability, and your monitoring group's water monitoring goals and funding availability. However, with a limited amount of data it is difficult to determine accurate and representative water quality trends. Since weather patterns and activity in the watershed can change throughout the summer, from year to year, and even from hour to hour during a rain event, it is a good idea to sample each lake at least once per month over the course of the season.

If you are having difficulty finding volunteers to help sample, or to pick-up or drop-off equipment at one of the laboratories, please give the VLAP Coordinator a call and we will try to help you work out an arrangement.

FIGURE INTERPRETATION

- **Figure 1 and Table 1:** Figure 1 (Appendix A) shows the historical and current year chlorophyll-a concentration in the water column. Table 1 (Appendix B) lists the maximum, minimum, and mean concentration for each sampling season that each lake has been monitored through VLAP.

  Chlorophyll-a, a pigment found in plants, is an indicator of the algal abundance. Because algae are usually microscopic plants that contain chlorophyll-a, and are naturally found in lake ecosystems, the chlorophyll-a concentration measured in the water gives an estimation of the algal concentration or lake productivity. **The median summer chlorophyll-a concentration for New Hampshire's lakes and ponds is 4.58 mg/m^3.**

Ossipee System Current Year Chlorophyll-a Data (2005)

	July 27, 2005 Result (mg/m³)	**Comparison to NH Median**	**Comparison to Similar Lake Median**
Lake Ossipee	3.01	Less than	Less than
Lower Danforth Pond	4.53	Approx. equal to	Slightly greater than
Broad Bay	2.82	Much less than	Slightly less than
Leavitt Bay	2.80	Less than	Less than
Berry Bay	2.87	Less than	Less than

The current year data show that the chlorophyll-a mean on the **July** sampling event was ***generally less than*** the state median and similar lake median in each of the deep spots except for **Lower Danforth Pond**. The chlorophyll concentration in **Lower Danforth Pond** was ***approximately equal to*** the state median and was ***slightly greater than*** the similar lake median (for more information on the similar lake median, refer to Appendix F).

The current year show that the chlorophyll-a concentration was ***highest*** at the **Lower Danforth Pond** deep and ***second-highest*** at the **Lake Ossipee** deep spot. The chlorophyll concentration at the **Broad Bay, Leavitt Bay,** and **Berry Bay** deep spots were ***approximately equal.***

Ossipee System Historic Chlorophyll-a Data

	Sampling Period	**Visual Analysis Trend**	**Statistical Analysis Trend and Percent Change in Annual Mean per Sampling Season**
Lake Ossipee	2003 - 2005	Variable (ranging from 1.57 to 3.0 mg/m³)	N/A*
Lower Danforth Pond	2003 - 2005	Variable (ranging from 2.68 to 4.53 mg/m³)	N/A*
Broad Bay	1990 - 2005	Slightly Variable (ranging between approx. 1.23 – 3.46 mg/m³)	No statistically significant overall increase or decrease since monitoring began.
Leavitt Bay	1990 - 2005	Ranging from 1.07 to 3.24 mg/m³, but overall increase	Statistically significant increase (worsening) of approx. 3.6% per year since 1990.
Berry Bay	2003 - 2005	Slight increase (worsening), ranging from 2.35 to 2.87 mg/m³)	N/A*

N/A* = Not applicable. This deep spot has been sampled for three summers through VLAP. In order to statistically determine trends, at least 10 consecutive sampling seasons of data must be collected.

Overall, visual inspection of the historical data trend line for **Lake Ossipee** and **Lower Danforth Pond** shows a ***variable*** in-lake chlorophyll-a trend since monitoring began in **2003.** Visual inspection of the historical data trend line for **Berry Bay** shows a ***slightly increasing (meaning slightly worsening)*** in-lake chlorophyll-a trend since monitoring began in **2003**. Please keep in mind that these trends are based on limited data. As your group expands its sampling program to include at least three sampling events per summer, we will be able to determine trends with more accuracy and confidence. After 10 consecutive years of sample collection, we will be able to conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean chlorophyll-a concentration since monitoring began.

Overall, the statistical analysis of the historical data show that the **Broad Bay** mean annual chlorophyll-a concentration has ***fluctuated slightly***, but has ***not significantly changed*** (either *continually increased* or *decreased*), since monitoring began in **1990**. (Note: Please refer to Appendix E for the detailed statistical analysis explanation and data print out.)

Overall, the statistical analysis of the historical data shows that the **Leavitt Bay** chlorophyll-a concentration has ***significantly increased*** since monitoring began. Specifically, the chlorophyll-a concentration has ***increased*** (meaning ***worsened***) on average by ***approximately 3.6 %*** per sampling season during the sampling period **1990** to **2005.** (Note: Please refer to Appendix E for the statistical analysis explanation and data print out.)

While algae are naturally present in all lakes, an excessive or increasing amount of any type is not welcomed. In freshwater lakes, phosphorus is the nutrient that algae depend upon for growth. Algal concentrations may increase as nonpoint sources of phosphorus from the watershed increase, or as in-lake phosphorus sources increase (such as sediment phosphorus releases, known as internal loading). Therefore, it is extremely important for volunteer monitors to continually educate all watershed residents about activities within the watershed that affect phosphorus loading and lake quality.

- **Figure 2 and Table 3:** Figure 2 (Appendix A) shows the historical and current year data for lake transparency. Table 3 (Appendix B) lists the maximum, minimum and mean transparency data for each sampling season that each lake has been monitored through VLAP.

Volunteer monitors use the Secchi-disk, a 20 cm disk with alternating black and white quadrants, to measure water clarity (how far a person can see into the water). Transparency, a measure of water clarity, can be affected by the amount of algae and sediment from erosion, as well as the natural colors of the water. **The median summer transparency for New Hampshire's lakes and ponds is 3.2 meters.**

Ossipee System Current Year Transparency Data (2005)

	July 27, 2005 Result (meters)	**Comparison to NH Median**	**Comparison to Similar Lake Median**
Lake Ossipee	3.05	Slightly less than	Slightly less than
Lower Danforth Pond	4.05	Greater than	Slightly less than
Broad Bay	3.25	Slightly greater than	Much less than
Leavitt Bay	3.85	Greater than	Slightly less than
Berry Bay	3.48	Slightly greater than	Less than

The transparency readings at the deep spots on the **July** sampling event ranged between approximately **3.05** and **4.05 meters**, with the transparency being the ***deepest*** in **Lower Danforth Pond** and the ***shallowest*** in **Lake Ossipee**.

Ossipee System Historic Transparency Data

	Sampling Period	**Visual Analysis Trend**	**Statistical Analysis Trend and Percent Change in Annual Mean per Sampling Season**
Lake Ossipee	2003 - 2005	Variable (ranging between approx. 3.05 and 4.90 meters)	N/A*
Lower Danforth Pond	2003 - 2005	Slightly variable (ranging between approx. 3.9 and 4.75 meters)	N/A*
Broad Bay	1990 - 2005	Decreasing (worsening)	Statistically significant decrease (worsening) of approx. 2.7% per year since 1990.
Leavitt Bay	1990 - 2005	Decreasing (worsening)	No statistically significant overall increase or decrease since monitoring began. However, the decreasing (worsening) visual trend will become statistically significant if the mean annual transparency continues to decrease.
Berry Bay	2003 - 2005	Variable (ranging between approx. 3.48 and 4.96 meters)	N/A*

N/A* = Not applicable. This deep spot has been sampled for three seasons through VLAP. In order to statistically determine trends, at least 10 consecutive sampling seasons of data must be collected.

Overall, visual inspection of the historical data trend line (the bottom graph) shows a ***variable*** trend for in-lake transparency for **Lake Ossipee, Lower Danforth Pond,** and **Berry Bay** since monitoring began in **2003.** Again, please keep in mind that these trends are based on limited data As previously discussed, after 10 consecutive years of sample collection, we will be able to conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean transparency since monitoring began.

Overall, the statistical analysis of the historical data for the **Broad Bay** deep spot shows that the transparency has ***significantly decreased*** since monitoring began. Specifically, the in-lake transparency has ***decreased*** (meaning ***worsened***) on average by ***approximately 2.7 %*** per sampling season during the sampling period **1990** to **2005**. (Note: Please refer to Appendix E for the statistical analysis explanation and data print out.)

Overall, the statistical analysis of the historical data for the **Leavitt Bay** deep spot shows that the mean annual in-lake transparency has ***not significantly changed*** since monitoring began in **1990.** However, it is important to point out that visual inspection of the trend line indicates a ***decreasing (meaning worsening)*** trend since monitoring began. If the mean annual transparency continues to decrease, the worsening trend will become statistically significant. (Note: Please refer to Appendix E for the statistical analysis explanation and data print out.)

Typically, high intensity rainfall causes sediment erosion to flow into lakes and streams, thus increasing turbidity and decreasing clarity. Efforts should continually be made to stabilize stream banks, lake shorelines, disturbed soils within the watershed, and especially dirt roads located immediately adjacent to the edge of tributaries and the lake. Guides to Best Management Practices designed to reduce, and possibly even eliminate, nonpoint source pollutants, such as sediment loading, are available from DES upon request.

- **Figure 3 and Table 8:** The graphs in Figure 3 (Appendix A) show the amount of epilimnetic (upper layer) phosphorus and hypolimnetic (lower layer) phosphorus; the inset graphs show current year data. Table 8 (Appendix B) lists the annual maximum, minimum, and median concentration for each deep spot layer and each tributary since each lake has joined VLAP.

Phosphorus is the limiting nutrient for plant and algae growth in New Hampshire's freshwater lakes and ponds. Excessive phosphorus in a lake can lead to increased plant and algal growth over time. **The median summer total phosphorus concentration in the epilimnion (upper layer) of New Hampshire's lakes and ponds is 12 ug/L. The median summer phosphorus concentration in the hypolimnion (lower layer) is 14 ug/L.**

Ossipee System Current Year Deep Spot Epilimnetic Phosphorus Data (2005)

	July 27, 2005 Epilimnion Result (ug/L)	Comparison to NH Median	Comparison to Similar Lake Median
Lake Ossipee	8	Less than	Slightly greater than
Lower Danforth Pond	10	Slightly less than	Slightly greater than
Broad Bay	7	Less than	Slightly greater than
Leavitt Bay	8	Less than	Slightly greater than
Berry Bay	9	Less than	Slightly greater than

The epilimnetic phosphorus concentration at the deep spots on the **July** sampling event ranged between approximately **7** and **10 ug/L** with the concentration being the ***highest*** in **Lower Danforth Pond** and the ***lowest*** in **Broad Bay.**

Ossipee System Current Year Deep Spot Hypolimnetic Phosphorus Data (2005)

	July 27, 2005 Hypolimnion Result (ug/L)	Comparison to NH Median	Comparison to Similar Lake Median
Lake Ossipee	7	Less than	Approx. equal to
Lower Danforth Pond	11	Less than	Less than
Broad Bay	11	Less than	Approx. equal to
Leavitt Bay	8	Less than	Less than
Berry Bay	10	Less than	Less than

The hypolimnetic phosphorus concentration at the deep spots on the **July** sampling event ranged between approximately **7** and **11 ug/L** with the concentration being the ***highest*** in **Lower Danforth Pond** and the ***lowest*** in **Lake Ossipee.**

Ossipee System Historic Epilimnetic Phosphorus Data

	Sampling Period	Visual Analysis Trend	Statistical Analysis Trend
Lake Ossipee	2003 - 2005	Relatively stable (ranging from 6 to 8 ug/L)	N/A*
Lower Danforth Pond	2003 - 2005	Slightly variable (ranging from 8 to 12 ug/L)	N/A*
Broad Bay	1990 - 2005	Relatively Stable (ranging between approx 6 and 10 ug/L)	No statistically significant overall increase or decrease since monitoring began.
Leavitt Bay	1990 - 2005	Slightly Variable (Ranging between approx 4 and 12 ug/L)	No statistically significant overall increase or decrease since monitoring began.
Berry Bay	2003 - 2005	Slightly increasing (slightly worsening)	N/A*

Overall, visual inspection of the epilimnetic phosphorus historical data trend line for **Lower Danforth Pond** shows a ***slightly variable*** trend, for **Lake Ossipee** shows a ***relatively stable***, and for **Berry Bay** shows a ***slightly worsening*** trend since monitoring began in **2003.** Again, please keep in mind that these trends are based on limited data As previously discussed, after 10 consecutive years of sample collection, we will be able to conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean transparency since monitoring began.

Ossipee System Historic Hypolimnetic Phosphorus Data

	Sampling Period	Visual Analysis Trend	Statistical Analysis Trend
Lake Ossipee	2003 - 2005	Slightly variable (ranging from 7 to 9 ug/L)	N/A*
Lower Danforth Pond	2003 - 2005	Decreasing (improving)	N/A*
Broad Bay	1990 - 2005	Slightly increasing (worsening)	Statistically significant increase (worsening) of approx. 2.9% per year since 1990.
Leavitt Bay	1990 - 2005	Slightly increasing (worsening)	Statistically significant increase (worsening) of approx. 0.04% per year since 1990.
Berry Bay	2003 - 2005	Slightly variable (ranging from 7 to 10 ug/L)	N/A*

N/A* = Not applicable. This deep spot has been sampled for three seasons through VLAP. In order to statistically determine trends, at least 10 consecutive sampling seasons of data must be collected.

Overall, visual inspection of the hypolimnetic phosphorus historical data trend line shows a ***decreasing (meaning improving)*** trend for **Lower Danforth Pond,** and a ***slightly variable*** trend for **Lake Ossipee** and **Berry Bay** since monitoring began in **2003**. Again, please keep in mind that these trends are based on limited data. As discussed previously, after 10 consecutive years of sample collection, we will be able to conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean phosphorus concentration since monitoring began.

Overall, the statistical analysis of the historical data shows that the phosphorus concentration in the hypolimnion (lower layer) has ***significantly increased*** in **Broad Bay** and **Leavitt Bay** since monitoring began. Specifically, the hypolimnetic phosphorus concentration in **Broad Bay** has ***increased*** (meaning ***worsened***) on average at a rate of approximately **2.9%** per season, and the hypolimnetic concentration in **Leavitt Bay** has ***increased*** (meaning ***worsened***) on average at a rate of approximately **0.04%** per season during the sampling period **1990** to **2005.** (Please refer to Appendix E for the statistical analysis explanation and data print out.)

One of the most important approaches to reducing phosphorus loading to a waterbody is to continually educate watershed residents about its sources and how excessive amounts can adversely impact the ecology and the recreational, economical, and ecological value of lakes and ponds. Phosphorus sources within a lake's watershed typically include septic systems, animal waste, lawn fertilizer, road and construction erosion, and natural wetlands.

TABLE INTERPRETATION

- **Table 2: Phytoplankton**

Table 2 (Appendix B) lists the current and historical phytoplankton species observed in each lake. Specifically, this table lists the most dominant phytoplankton species observed in the sample and their relative abundance in the sample.

Ossipee System Current Year Phytoplankton Dominant Species (2005)

	July 27, 2005 Dominant Phytoplankton Species
Lake Ossipee	*Rhizosolenia* (diatom) *Sphaerocystis* (green) *Mallomonas* (golden-brown)
Lower Danforth Pond	*Asterionella* (diatom) *Dinobryon* (golden-brown) *Synura* (golden-brown)
Broad Bay	*Rhizosolenia* (diatom) *Asterionella* (diatom) *Tabellaria* (diatom)
Leavitt Bay	*Rhizosolenia* (diatom) *Dinobryon* (golden-brown) *Sphaerocystis* (green) *Asterionella* (diatom)
Berry Bay	*Rhizosolenia* (diatom) *Chroococcus* (cyanobacteria) *Dinobryon* (golden-brown)

Diatoms and **golden-brown algae** generally dominated the July phytoplankton sample at each deep spot this season.

Phytoplankton populations undergo a natural succession during the growing season (Please refer to the "Biological Monitoring Parameters" section of this report for a more detailed explanation regarding seasonal plankton succession). Diatoms and golden-brown algae are typical in New Hampshire's less productive lakes and ponds.

- **Table 2: Cyanobacteria**
  A **small amount** of the cyanobacteria ***Anabaena, Microcystis*** and/or ***Oscillatoria*** was/were observed in each of the **July** deep spot phytoplankton sample this season, as follows:

Ossipee System Current Year Cyanobacteria Species Observed (2005)

	July 27, 2005 Cyanobacteria Species Observed
Lake Ossipee	*Microcystis* *Anabaena*
Lower Danforth Pond	*Anabaena*
Broad Bay	*Anabaena*
Leavitt Bay	*Microcystis* *Anabaena*
Berry Bay	*Anabaena* *Oscillatoria*

These species, if present in large amounts, can be toxic to livestock, wildlife, pets, and humans. (Please refer to the "Biological Monitoring Parameters" section of this report for a more detailed explanation regarding cyanobacteria).

Cyanobacteria can reach nuisance levels when phosphorus loading from the watershed to surface waters is increased (this is often caused by rain events) and favorable environmental conditions occur (such as a period of sunny, warm weather).

The presence of cyanobacteria serves as a reminder of each lake's delicate balance. Watershed residents should continue to act proactively to reduce nutrient loading to each lake by eliminating fertilizer use on lawns, keeping the lake shoreline natural, re-vegetating cleared areas within the watershed, and properly maintaining septic systems and roads.

In addition, residents should also observe each lake in September and October during the time of fall turnover (lake mixing) to document any algal blooms that may occur. Cyanobacteria have the ability to regulate their depth in the water column by producing or releasing gas from vesicles. However, occasionally lake mixing can affect their buoyancy and cause them to rise to the surface and bloom. Wind and currents tend to "pile" cyanobacteria into scums that accumulate in one section of the lake. If a fall bloom occurs, please collect a sample (any clean jar or bottle will be suitable) and contact the VLAP Coordinator.

➢ **Table 4: pH**
Table 4 (Appendix B) presents the in-lake and tributary current year and historical pH data.

pH is measured on a logarithmic scale of 0 (acidic) to 14 (basic). pH is important to the survival and reproduction of fish and other aquatic life. A pH below 6.0 limits the growth and reproduction of fish. A pH between 6.0 and 7.0 is ideal for fish. The median pH value for the epilimnion (upper layer) in New Hampshire's lakes and ponds is **6.6**, which indicates that the surface waters in the state are slightly acidic. For a more detailed explanation regarding pH, please refer to the "Chemical Monitoring Parameters" section of this report.

The pH at the deep spot this season ranged from **6.10** to **6.22** in the **hypolimnion** and from **6.64** to **6.85** in the **epilimnion**, which means that the water in each lake is ***slightly acidic.***

It is important to point out that the pH in the hypolimnion (lower layer) was ***lower (more acidic)*** than in the epilimnion (upper layer) in each lake. This increase in acidity near the lake bottom is likely due the decomposition of organic matter and the release of acidic by-products into the water column.

Due to the presence of granite bedrock in the state and acid deposition (from snowmelt, rainfall, and atmospheric particulates) in New Hampshire, there is not much that can be done to effectively increase lake pH.

➢ **Table 5: Acid Neutralizing Capacity**
Table 5 (Appendix B) presents the current year and historical epilimnetic ANC for each year each lake has been monitored through VLAP.

Buffering capacity (ANC) describes the ability of a solution to resist changes in pH by neutralizing the acidic input. The median ANC value for New Hampshire's lakes and ponds is **4.9 mg/L**, which indicates that many lakes and ponds in the state are at least "moderately vulnerable" to acidic inputs. For a more detailed explanation, please refer to the "Chemical Monitoring Parameters" section of this report.

The Acid Neutralizing Capacity (ANC) in the epilimnion (the upper layer) of **Lake Ossipee, Broad Bay, Leavitt Bay,** and **Berry Bay** ranged from **4.4 to 5.5 mg/L**, which is ***approximately equal*** the state mean, and indicates that the surface water in these locations is ***moderately vulnerable*** to acidic inputs.

The ANC in the epilimnion of **Lower Danforth Pond** on the **July** sampling event was **8.6 mg/L**, which is ***greater than*** the state mean, and indicates that the surface water in this location is ***moderately vulnerable*** to acidic inputs.

- **Table 6: Conductivity**

Table 6 (Appendix B) presents the current and historical conductivity values for tributaries and in-lake data. Conductivity is the numerical expression of the ability of water to carry an electric current (which is determined by the number of negatively charged ions from metals, salts, and minerals in the water column). The median conductivity value for New Hampshire's lakes and ponds is **40.0 uMhos/cm**. For a more detailed explanation, please refer to the "Chemical Monitoring Parameters" section of this report.

The epilimnetic conductivity at the deep spots on the **July** sampling event ranged from **44.71 (Lake Ossipee)** to **54.16 (Lower Danforth Pond)**. These values are ***greater than*** the state median.

The epilimnetic conductivity has ***gradually increased*** at the **Broad Bay** and **Leavitt Bay** deep spots since monitoring began in **1990.**

Typically, sources of increasing conductivity are due to human activity. These activities include failed or marginally functioning septic systems, agricultural runoff, and road runoff (which contains road salt during the spring snow melt). New development in the watershed can alter runoff patterns and expose new soil and bedrock areas, which could contribute to increasing conductivity. In addition, natural sources, such as iron and manganese deposits in bedrock, can influence conductivity.

We also recommend that your monitoring group conduct a shoreline conductivity survey of the lakes to help pinpoint the sources of ***elevated*** conductivity.

To learn how to conduct a shoreline or tributary conductivity survey, please refer to the 2004 "Special Topic Article" or contact the VLAP Coordinator.

Please note that tributary sampling was not conducted through VLAP during the 2003, 2004, or 2005 season. We recommend that your monitoring group add tributary monitoring to the sampling program since it is important to determine the quality of the water that flows into the lake system, including determining sources of conductivity.

It is possible that de-icing materials applied to nearby roadways during the winter months may be influencing the conductivity in the lakes. In New Hampshire, the most commonly used de-icing material is salt (sodium chloride).

A limited amount of chloride sampling was conducted by the DES Lake Survey Program during the Summer of 2003. Please refer to the discussion of Table 13 for information on the chloride results.

- **Table 8: Total Phosphorus**

  Table 8 (Appendix B) presents the current year and historical total phosphorus data for in-lake and tributary stations. Phosphorus is the nutrient that limits the algae's ability to grow and reproduce. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

  As discussed previously, tributary sampling was not conducted through VLAP during the Summer of 2003, 2004 or 2005. Consequently, we do not have an indication of the phosphorus concentration in the tributaries that flow into the ***Lake Ossipee System.***

- **Table 9 and Table 10: Dissolved Oxygen and Temperature Data**

  Table 9 (Appendix B) shows the dissolved oxygen/temperature profile(s) for the 2005 sampling season. Table 10 (Appendix B) shows the historical and current year dissolved oxygen concentration in the hypolimnion (lower layer). The presence of dissolved oxygen is vital to fish and amphibians in the water column and also to bottom-dwelling organisms. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

  The dissolved oxygen concentration in the bottom meter at the deep spot of **Lake Ossipee, Broad Bay,** and **Leavitt Bay** was ***relatively high*** **(7.76 mg/L, 5.08 mg/L, and 7.56 mg/L, respectively)** on the **July** sampling event.

  The dissolved oxygen concentration in the bottom meter at the deep spot of **Lower Danforth Pond** and **Berry Bay** was ***relatively low*** **(0.61 mg/L and 0.83 mg/L, respectively)** on the **July** sampling event. As stratified lakes age, and as the summer progresses, oxygen typically becomes ***depleted*** in the hypolimnion by the process of decomposition. Specifically, the loss of oxygen in the hypolimnion results primarily from the process of biological breakdown of organic matter (i.e.; biological organisms use oxygen to break down organic matter), both in the water column and particularly at the bottom of the lake where the water meets the sediment. When oxygen levels are depleted to less than 1 mg/L in the hypolimnion, the phosphorus that is normally bound up in the sediment may be re-released into the water column (a process referred to as ***internal phosphorus loading***).

- **Table 11: Turbidity**
  Table 11 (Appendix B) lists the current year and historical data for in-lake and tributary turbidity. Turbidity in the water is caused by suspended matter, such as clay, silt, and algae. Water clarity is strongly influenced by turbidity. Please refer to the "Other Monitoring Parameters" section of this report for a more detailed explanation.

  The deep spot turbidity was ***relatively low*** on the **July** sampling event which suggests that the lake bottom was ***not*** disturbed while sampling. When the lake bottom is disturbed, sediment, which typically contains attached phosphorus, is released into the water column. When collecting the hypolimnion sample, make sure that there is no sediment in the Kemmerer Bottle before filling the sample bottles.

- **Table 12: Bacteria (*E.coli*)**
  Table 12 lists only the historical data for bacteria *(E.coli*) testing. (Please note that Table 12 now lists the maximum and minimum results for all past sampling seasons.) *E. coli* is a normal bacterium found in the large intestine of humans and other warm-blooded animals. *E.coli* is used as an indicator organism because it is easily cultured and its presence in the water, in defined amounts, indicates that sewage **MAY** be present. If sewage is present in the water, potentially harmful disease-causing organisms **MAY** also be present.

  Bacteria sampling was not conducted this year. If residents are concerned about sources of bacteria such as failing septic systems, animal waste, or waterfowl waste, it is best to conduct *E. coli* testing when the water table is high, when beach use is heavy, or immediately after rain events.

- **Table 13: Chloride**
  The chloride ion (Cl^-) is found naturally in some surfacewaters and groundwaters and in high concentrations in seawater. Research has shown that ***elevated*** chloride levels can be toxic to freshwater aquatic life. In order to protect freshwater aquatic life in New Hampshire, the state has adopted **acute and chronic** chloride criteria of **860 and 230 mg/L** respectively. The chloride content in New Hampshire lakes is naturally low, generally less than 2 mg/L in surface waters located

in remote areas away from habitation. Higher values are generally associated with salted highways and, to a lesser extent, with septic inputs. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

The **deep spot** of **Lake Ossipee, Leavitt Bay,** and **Berry Bay** was sampled for chloride by the **DES Lake Survey Program** in **2003**. The results ranged from **3 to 7 mg/L**, which is ***much less than*** the state acute and chronic chloride criteria.

However, we recommend that your monitoring group sample the major inlets to the **Lake Ossipee System** in the spring soon after snow-melt and after rain events during the summer. This will establish a baseline of data which will assist your monitoring group and DES in determining lake quality trends in the future.

- **Table 14: Current Year Biological and Chemical Raw Data**
  This table lists the most current sampling season results. Since the maximum, minimum, and annual mean values for each parameter are not shown on this table, this table displays the current year "raw" (meaning unprocessed) data. The results are sorted by station, depth zone (epilimnion, metalimnion, and hypolimnion) and parameter.

- **Table 15: Station Table**
  As of the Spring of 2004, all historical and current year VLAP data are included in the DES Environmental Monitoring Database (EMD). To facilitate the transfer of VLAP data into the EMD, a new station identification system had to be developed. While volunteer monitoring groups can still use the sampling station names that they have used in the past (and are most familiar with), an EMD station name also exists for each VLAP sampling location. For each station sampled at each lake. Table 15 identifies what EMD station name corresponds to the station names you have used in the past and will continue to use in the future.

DATA QUALITY ASSURANCE AND CONTROL

Annual Assessment Audit:

During the annual visit to each lake, the biologist conducted a "Sampling Procedures Assessment Audit" for your monitoring group. Specifically, the biologist observed the performance of your monitoring group while sampling and filled out an assessment audit sheet to document the ability of the volunteer monitors to follow the proper field sampling procedures (as outlined in the VLAP Monitor's Field Manual). This assessment is used to identify any aspects of sample collection in which volunteer monitors fail to follow proper procedures, and also provides an opportunity for the biologist to retrain the volunteer monitors as necessary. This will ultimately ensure that the samples that the volunteer monitors collect are truly representative of actual lake and tributary conditions.

Overall, your monitoring group did an ***excellent*** job collecting samples on the annual biologist visit this season! Specifically, the members of your monitoring group followed the proper field sampling procedures and there was no need for the biologist to provide additional training. Keep up the good work!

USEFUL RESOURCES

Acid Deposition Impacting New Hampshire's Ecosystems, NHDES Fact Sheet ARD-32, (603) 271-2975 or www.des.state.nh.us/factsheets/ard/ard-32.htm.

Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials, NHDES Booklet WD-03-42, (603) 271-2975.

Cyanobacteria in New Hampshire Waters Potential Dangers of Blue-Green Algae Blooms, NHDES Fact Sheet WMB-10, (603) 271-2975 or www.des.state.nh.us/factsheets/wmb/wmb-10.htm.

Erosion Control for Construction in the Protected Shoreland Buffer Zone, NHDES Fact Sheet WD-SP-1, (603) 271-2975 or www.des.state.nh.us/factsheets/sp/sp-1.htm.

Impacts of Development Upon Stormwater Runoff, NHDES Fact Sheet WD-WQE-7, (603) 271-2975 or www.des.state.nh.us/factsheets/wqe/wqe-7.htm.

Low Impact Development: Taking Steps to Protect New Hampshire's Surface Waters NHDES Fact Sheet WD-WMB-16, (603) 271-2975 or www.des.state.nh.us/factsheets/wmb/wmb-17.htm.

Road Salt and Water Quality, NHDES Fact Sheet WD-WMB-4, (603) 271-2975 or www.des.state.nh.us/factsheets/wmb/wmb-4.htm.

Sand Dumping - Beach Construction, NHDES Fact Sheet WD-BB-15, (603) 271-2975 or www.des.state.nh.us/factsheets/bb/bb-15.htm.

Watershed Districts and Ordinances, NHDES Fact Sheet WD-WMB-16, (603) 271-2975 or www.des.state.nh.us/factsheets/wmb/wmb-16.htm.